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TELECOMMUNICATIONS

Special Sahelian Office

OUTLINE AND ANALYSIS OF TELECOMMUNICATION PROBLEMS IN THE SUDANO-SAHELIAN ZONE

1. THE PROBLEM

(a) From 1960 onwards, rainfall began to decline in the Sahel and the areas of drought began to spread south. The situation worsened in 1972-1973, bringing disaster to the Sudano-Sahelian zone.

Emergency operations were set in motion. They consisted of:

Supplying seeds;

Supplying food and vaccine for cattle;

Drilling wells and preparing water-supply points.

Implementation of this emergency programme was of necessity dependent mainly on the availability of means of transport.

The transport problem very quickly ran up against major difficulties; the state of the roads, difficulty in arranging air-lifts speedily, difficulty in storing goods, and so on.

The officials in charge of the emergency operations had to be able to lay their hands, at any moment, on the necessary data concerning:

The general situation of the population;

The condition of the livestock and the status of food reserves in the various affected areas;

The most urgent needs to be met;

The condition of the means of communication and transport equipment.

In addition, the headquarters at Ouagadougou had to be able at all times to contact national and international bodies collaborating in the programme.

Only an effective telecommunication network could guarantee rapid transmission of information and thus serve as an essential aid to the proper implementation of the programme.

(b) Map 3, annexed hereto, shows the current status of the telecommunication network in the Sudano-Sahelian zone:

(i) General speaking, there are telecommunication links between the State capital and the main town of each prefecture or subprefecture (the latter via the former). High-frequency radio equipment is used in most cases. The channels are open only between certain hours;

(ii) There are direct communication links between the various capitals, except in the case of Chad and Mauritania, which have to route calls through Paris and through Dakar or Paris respectively;

(iii) The villages have no telecommunication service.

2. PLACE AND ROLE OF TELECOMMUNICATIONS IN THE NATIONAL ECONOMY AND RELATIONSHIP WITH OTHER SECTORS OF ACTIVITY

(a) The economic development of a country brings about a development in the complementary relationships among producers and between producers and consumers. Telecommunications cut down distances and thus are an essential element of economic organization.

In order to measure the effect of telecommunications on the organization and economic development of countries in general, studies have been carried out at the country level and at the international level on:

Per capita telephone density;

The correlation between an increase in urban telephone calls and per capita gross domestic product;

The correlation between an increase in interurban calls and per capita gross domestic product and the internal structure of telecommunication services (tariff structure, level of technical development, quality of service);

The correlation between an increase in international calls and trade;

The influence of the development of the various sectors of activity on the rate of development of telephone and telex services.

These studies have shown that there is a correlation between economic development, represented by GDP, and the development of telecommunications. The correlation coefficient varies from a few hundredths to nearly one for different countries, services and sectors of activity.

The following tables show the changes in telephone density and gross domestic product in the Sahelian countries.

UPPER VOLTA	1965	1967	1971
GDP $US	46.8	(50)	70
Number of telephones of all kinds	2,791	2,917	3,834
Telephone density (per 100 inhabitants)	0.059	0.06	0.06

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MALI	1960	1964	1966	1971
GDP $US	80	81.1	90	70
Number of telephones of all kinds	2,701	4,187	4,793	5,195
Telephone density (per 100 inhabitants)	0.065	0.093	0.103	0.10

MAURITANIA	1964	1966	1968	1971
GDP $US	143	160	168	170
Number of telephones of all kinds	1,100	1,600	2,790	4,284
Telephone density (per 100 inhabitants)	0.108	0.15	0.32	0.40

NIGER	1962	1964	1968	1971
GDP $US	82.7	77.4		100
Number of telephones of all kinds	1,631	2,227	3,172	4,225
Telephone density (per 100 inhabitants)	0.054	0.065	0.083	0.10

SENEGAL	1962	1965	1967	1971
GDP $US	171.6	189.9	187.4	250
Number of telephones of all kinds	23,859	25,321	25,581	28,335
Telephone density (per 100 inhabitants)	0.73	0.73	0.70	0.72

CHAD	1961	1963	1967	1971
GDP $US	62.3	66	70	80
Number of telephones of all kinds	1,813	2,365	3,847	4,787
Telephone density (per 100 inhabitants	0.058	0.074	0.111	0.13

Note: The latest GDP figures are mainly indicative, owing to currency fluctuations.

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Two conclusions can be drawn from these tables:

The first is that, on the whole, the telephone density is very low. In Senegal it is close to 1 per cent, but in the other countries it is about 1 per mil. This compares with densities of 22 in Belgium, 15 in Spain, 18 in France, 51 in Switzerland and 1.43 in Gabon (1970);

The second is that there is little correlation between GDP and telephone density. From the additional figures given below, which show the number of telephones in use in several capital cities:

Ouagadougou	2,460	(main telephones and extensions)
Nouakchott	3,915	(" " " ")
Niamey	3,060	(" " " ")

it becomes clear at once that most telephone installations (60 to 90 per cent) are situated in the capitals and consequently that this public service is less available to the rural population. The low correlation between GDP and telephone density supports that observation.

(b) Relationship with other sectors of activity

The study of telecommunications development in a country is based mainly on data regarding telephones, telegraph and telex, whose impact on the national economy is more easily measured.

However, telecommunications include not only telephone, telegraph and telex but also data transmission, radio and television, aviation and shipping communications, weather forecasts and transmissions connected with the mobile land service.

Telecommunications are necessary in order to organize the various sectors of activity planned for by the Permanent Inter-State Committee.

(i) Agriculture

Telephone and telegraph service has a direct impact on the development of agriculture, since it is a factor in the organization of relations among producers (of both agricultural and industrial goods such as agricultural machinery, fertilizer and insecticides) and between producers and consumers. The extent of this impact depends on the level of development of agriculture in the areas concerned. In addition, large agricultural operations, the management of which raises various problems, cannot be cut off from the national decision-making centres or from commercial centres. The existence of telecommunication links in certain areas encourages the establishment of agricultural centres.

Another telecommunication medium, radio and television broadcasting directly

influences the agricultural organization of peasants. By facilitating contacts, discussions and demonstrations, radio broadcasting makes it possible to change the way peasants work and to improve agricultural work on a lasting basis.

(ii) Management of pastureland and animal production

As in the case of agriculture, telecommunications facilitate contacts with other producers and with consumers. In addition, with telephone and telegraph facilities, the security services can act rapidly in the event of the deterioration of pastureland or epidemics, as can the veterinary services for the performance of their various day-to-day tasks. By using such facilities, the efforts of these action services can be concentrated with a view to getting the best results from them. Radio and television broadcasting play the same role as they do in agriculture.

(iii) Management of water resources

The role which telecommunications play in the management of water resources depends on the size of the works in question. This role may consist either of providing simple information at regular intervals by telephone or of supplying more complex information, using the technique of data transmission, in the case of large works.

Lastly, telecommunications are a valuable aid for the successful organization of construction sites for dams or irrigation works.

(iv) Transport infrastructure

There is no airline which does not have telecommunication links with airports.

Similarly, maritime and major river shipping maintains telecommunication links with ports.

Lastly, telecommunications play a role in the organization of land transport on routes of major economic importance.

(v) Health

In all countries, doctors have some priority in obtaining telephones. In Africa, most of the doctors are in fairly large towns, while others specialize in making rounds of the villages. The towns nearly always have telecommunication facilities.

The future increase in the number of people consulting a doctor, and the improved health training of the population of the Sahel, will necessitate the use of a modest telecommunication system linking the rural areas and the towns, which will also permit rapid action in case of human or animal epidemics.

Furthermore, the use of radio broadcasting, and possibly of rural television, will help to improve health education in the villages.

(vi) Human resources (education and manpower)

Some countries in the Sahelian zone (Senegal and the Niger) are already using educational radio and television in order to enhance the effectiveness of their human resources. These media, which reach large audiences, will be very useful in accelerating intellectual and practical training.

(vii) Industry and commerce

These two sectors are the largest users of telecommunication services (telephone, telegraph and telex). Surveys conducted in 1964 in 100 countries show, for example, that the correlation between industrial GDP and telex density is 0.828.

There will therefore be a need for well-adapted telecommunication services in the various industrial and commercial centres.

(viii) Meteorology

Since meteorological data must be utilized immediately, they must be rapidly accessible, no matter how far away the readings are taken. The only way such data can be made available is through telecommunications, which are widely used by all meteorological services. The transmission systems currently in use range from high-frequency systems and microwave relay systems to space systems.

(ix) Mining

Telecommunications play a role in mineral prospecting, as in any other industrial work site.

Once a mine becomes operational, telecommunications will play the same role as in any industrial enterprise.

(x) Energy

Telecommunication facilities will be required for the maintenance of energy transmission lines from production centres to distribution centres. These facilities may take the form of high-frequency, ultra-high-frequency or carrier current equipment along the high-tension line. At the production centres themselves, small telephone exchanges will be needed to ensure permanent contact between the technicians responsible for maintenance and operation and those responsible for supervision at the site of the machinery.

(xi) Public services

The implementation of the rehabilitation programme for the Sahelian zone will require permanent contact between government officials, the Special Sahelian Office and experts working in the field. These contacts are necessary for, inter alia, the exchange of information, rapid decision-making and the discharge of certain urgent tasks.

Such contacts are possible only if telephone, telegraph and telex facilities are available. The structure of the telecommunication network will depend on how the rehabilitation programme is organized.

3. THE TELECOMMUNICATION SITUATION IN THE SUDANO-SAHELIAN ZONE AND PROJECTS IN OPERATION

(a) Telecommunications

(i) The existing network

Prior to independence, telecommunications in French-speaking Africa were managed by France on a federal basis from two offices, one in Central Africa, at Brazzaville, and the other in West Africa, at Dakar. This federal system was abolished a few years after independence.

The national offices have made great efforts to improve the telecommunication infrastructure and the quality of service.

Map 3 shows the status of telecommunications in the Sahelian zone. In addition, all the capital cities are connected to the outside world by decametre-wave links, and Senegal has recently established a telecommunication satellite ground station.

The efforts undertaken have focused primarily on meeting the requirements of those centres of interest which are most likely to yield a rapid return, such as industries, businesses, and various government services. These centres of interest are generally concentrated in large towns.

(ii) Proposed network

Pan-African Telecommunication Network - Pre-investment studies

In the context of the assistance now under consideration, this project is by far the most significant for the different countries in the Sudano-Sahelian zone, its ultimate aim being to provide the various countries with high-quality international links enabling them, in excellent circumstances, to route traffic of all kinds (particularly telephone, telegraph and telex traffic) among themselves and to other African countries and other continents.

(a) Map 1 presents information on the pan-African network:

In black, what already exists or is being installed;

In red, what will be carried out shortly and is already financed;

In blue, what is planned but is not yet financed.

(b) Table 1 indicates the status of the project in the Sudano-Sahelian zone.

TABLE 1

No.	COUNTRY	LINK	DIST. KM	SYSTEM	CIRCUITS 75	80	85	90	TOTAL COST $US (000)
19	Upper Volta	Ouagadougou-Koupela-Nalougou Niger frontier		HC* MRS**	53	77	121	197	1 560
		Koupela-Sango Togo frontier	145	HC MRS	6	10	15	25	598
		Bobo-Sikasso	145	HC MRS	16	25	36	58	424
		Ouagadougou	-	3TC ***	30	49	82	140	747
		Total							3 329
26	Mali	Bamako-Kayes	500	HC MRS	33	60	104	165	2 081
		Bamako-Sikasso	370	HC MRS	30	46	70	105	1 605
		Sikasso-Korhogo	-	-	-	-	-	-	-
		Bamako-Mopti	560	HC MRS	15	22	44	121	2 638
		Bamako-Sigouri	-	-	-	-	-	-	-
		Bamako	-	3TC					692
		Total							7 016
24	Mauritania	Akjoujt-Atar	200	MC MRS	34	35	75	110	) 1 582
		Akjoujt-Choum	87	coaxial	31	49	69	101	)
		Nouadhibou-Choum	500	coaxial	30	49	69	103	)
		Choum-F'Derick	163	MC MRS	22	34	47	68	3 294
		Rosso (Senegal)	12	-	-	-	-	-	32
		Nouakchott	-	3TC	16	32	56	118	460
		Total							5 368

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Table 1 (continued)

No.	COUNTRY	LINK	DIST. KM	SYSTEM	CIRCUITS				TOTAL COST $US (000)
					75	80	85	90	
15	Niger	Maradi-Kano	241		12	23	40	71	270
		Niamey-Dosso (Dahomey)	310	HC MRS	97	155	226	340	1 355
		Niamey-Ouagadougou	120	HC MRS	15	22	31	50	569
		Niamey	-	3TC	30	51	80	147	714
		Total							2 908
25	Senegal	Kaolack-Kidina	490	HC MRS	47	88	143	254	2 074
		Tambacounda-Koundara	130	HC MRS	32	58	102	180	684
		Koundara-Mali	-	-	-	-	-	-	-
		Total							2 758
8	Chad	Fort-Lamy-Moundou Sahr	700	HC MRS		68	93	138	4 078
		Fort-Lamy-Moundou Sahr+connexion to Central African Republic	760	HC MRS		8	9	12	4 588
		Fort-Lamy		3TC		25	40	62	260
		Total							4 848

HC = High capacity
MRS = Microwave relay system
3TC = Third-class transit centre
MC = Medium capacity

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The various problems relating to the financing and installation of the pan-African network were considered at the Addis Ababa meeting of November 1972.

A Co-ordination Committee was set up comprising the Organization of African Unity, the African Development Bank, the Economic Commission for Africa and ITU. In the matter of responsibilities, the African Development Bank is to advise on means of financing and ITU is to advise on the various phases of technical implementation.

ITU is now studying a new project covering activities to follow up the pre-investment studies so that different kinds of assistance can be provided to the countries, particularly:

Assessment of bid invitations for equipment. Quality control;

Supervision of installations and supervised start-up of links.

Other subregional projects

In the framework of regional co-operation, the countries of the Sahel have established various bodies with the purpose of developing certain regional zones of common interest.

Organization for Development of the Senegal River (OMVS) (Senegal, Mali, Mauritania). In 1971, the International Bank for Reconstruction and Development (IBRD) awarded a contract to Société Française d'Etudes et de Réalisation d'Equipement de Télécommunications (SOFRECOM) for a feasibility study on a telecommunications development project in the northern part of Senegal. This project, which focuses in particular on the Senegal valley (see figures 4 and 5) includes, inter alia:

A Thies-St. Louis-Richard Toll-Matam-Bakel microwave relay system, with cross-overs to important centres;

A local centre at St. Louis associated with a node forming a connecting and transit centre for Louga, Podor, Matam, Richard Toll and Dagana;

Connecting centres at Louga, Matam, Podor;

Several local centres.

Liptako-Gourma Authority (Upper Volta, Mali, Niger). At a meeting held in March 1972 at Niamey, telecommunication links and improvements anticipated in 1972-1973 for the region were defined.

Lake Chad Basin Commission (Niger, Chad, Nigeria, Cameroon). The last meeting of the Lake Chad Basin Commission was held in Yaoundé from 8 to 11 October 1973. The Commission considered the following projects: the NDjamena-Fort Fourreau-Maiduguri (Nigeria) link studied by USAID; the Maiduguri-Diffa (Niger) link submitted to AfDB.

(iii) Vocational training

As their telecommunication networks develop, the Governments of the countries of the Sudano-Sahelian zone have turned their attention to the training of technical personnel for them.

The higher-level personnel (engineers and inspectors) are trained abroad.

ITU and UNDP have provided vital assistance with regard to training in five of the six countries (the sixth being Mauritania). There is a multinational school, established with UNDP/ITU assistance, in Senegal.

(b) Radio broadcasting and television

Each of the six countries has a broadcasting service with several hectometre and decademetre wave transmitters in the capital city.

They generally range in power from a few kilowatts to 100 kW or 200 kW.

There are regional stations at:

Mali: Mopti;

Niger: Tera, Zinder, N'Guimi, Tillabéry, Maine, Soroa, Tahoua, Goure, Gaya;

Senegal: St. Louis, Ziguinchor, Kaolack, Tambacounda;

Upper Volta: Bobo-Dioulasso.

The Upper Volta, the Niger and Senegal have television. The Upper Volta plans to set up regional stations at Koudougou and Bobo-Dioulasso. The table below gives the 1973 statistics for radio and television receivers.

Country	Number of radio receivers	Number per 100 inhabitants	Number of television receivers
Upper Volta	90,000	1.6	4,000
Mali	75,000	1.6	-
Mauritania	80,000	6.7	-
Niger	100,000	2.5	500
Senegal	280,000	7.3	1,600
Chad	70,000	2.0	-

It can be seen that, except in the case of Senegal, the density of radio receivers is well below the minimum of 5 suggested by UNESCO 10 years ago.

The most significant fact about radio broadcasting is that the listening audience necessarily is relatively small. Moreover, even though no exact figures on the distribution of radio receivers among the population are available, it may be assumed that they are concentrated in the urban areas. Once again it is apparent that rural areas are not served so well as the urban centres.

The rural population, already at a disadvantage because of schooling and literacy difficulties and therefore scarcely reached at all by information (of any kind) in the form of periodicals and books, also receives very little of the benefit of radio broadcasting services. Attention must, however, be drawn to some very interesting recent achievements, such as the UNESCO project on rural education by radio in Senegal.

4. FUTURE OBJECTIVES

At the conclusion of the rehabilitation programme, the various population centres of the Sudano-Sahelian zone will be at a stage where they can develop normally.

In the telecommunications sector, the objective is to have in the Sudano-Sahelian zone a telecommunication network of the kind which is essential for the organization of economic and social activities.

The organization of this telecommunication network will take into account the plans proposed for the various sectors of activity: agriculture, animal production, water resources, transport, public health, human resources, mining, energy, meteorology and public services.

(a) Telephone, telegraph, telex

The network must be able to handle the national and international communications required by activities in the areas concerned;

Depending on the size of the villages, the telecommunication facilities will consist of either a telephone office with telephone counters for interurban calls or a local telephone network and telegraph counters, with possibly a telex system;

The network will be so organized as to give preference to the needs of the country over those of the towns;

The method of operation (manual, semi-automatic or automatic, full-time or between certain hours) will depend on the anticipated load, the distance between the centres of population and their priority rating.

(b) Radio and television broadcasting

Efforts should be concentrated first on radio and later on television.

The aim will be to give good coverage to the areas concerned, which are generally far from the capital, and to increase the density of radio receivers.

The installation of several hectometre-wave radio transmitters will facilitate coverage. These transmitters will be able to put out nation-wide broadcasts, using the appropriate transmitting equipment or short-wave relay stations. They will also be able to back up regional programmes.

The construction of broad-band transmission channels (e.g., microwave links, Bamal-Segou Mopti, Dakar-St.Louis-Rosso-Matam) will make it possible to use frequency modulation (FM) radio transmitters and improve listening quality, with the added advantage that energy consumption will be lower for technical facilities and maintenance will be simplified.

The broad-band transmission channels will make it possible to beam television broadcasts to relay stations which will then broadcast them to the areas concerned.

(c) Other means of telecommunication

Generally speaking, there are special telecommunication services for aviation and meteorology operated by the departments concerned. A high-quality public telecommunication network improves meteorological and civil aviation services by ensuring that they receive all the information they need: meteorological data, the position of aircraft and passengers.

The aim is to achieve co-ordination among the various telecommunication services in order to obtain the most effective use of the facilities.

5. PROJECTS

(i) Subregional telecommunication networks

OMVS, Lake Chad, Liptako-Gourma, Niger

Several large projects in the subregion are included in the pan-African telecommunication network project, in which ITU and several national and international organizations (OAU, ECA, AfDB, UNDP, IBRD, etc.) are co-operating. The projects for links forming part of the pan-African network are as follows:

Kaolack-Tambacounda, Kayes-Kita-Bamako;

Bamako-Sikasso-Bobo Dioulasso-Ouagadougou;

Ouagadougou-Niamey;

Niamay-Dosso-Maradi-Kano;

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Bamako-Segou Mopti;

Richard Toll-Rosso-Nouakchott-Akjoujt-Choum-F'Derick;

Nouadhibou-Choum.

Other subregional projects have also been identified by the countries concerned:

(a) OMVS

The project in progress in northern Senegal covers most of the telecommunication needs of that region.

Arrangements will be made for collaboration with OMVS and the Government of Senegal, so that during implementation of the project the Senegalese Post Office may take the Sahel rehabilitation programme into account.

(b) Lake Chad

The countries concerned have asked USAID to undertake a study of the NDjamena-Fort Fourreau-Maiduguri-Diffa link.

Collaboration will be arranged with the Lake Chad Basin Commission in order to co-ordinate these projects with those for the pan-African network and for the Sudano-Sahelian zone.

(c) Liptako-Gourma-Niger

The countries forming part of the Liptako-Gourma Authority have proposed the following links:

Mopti-Ouahigouya-Ouagadougou;

Ouagadougou-Kaya-Dori-Tambao-Ansongo;

Gao-Ansongo-Ayerou-Tillabéri-Niamey.

The towns of Mopti, Gao, Ansongo, Ayerou, Tillabéri and Niamey are on the River Niger. If other towns of a certain size (e.g., Tombouctou) are included in the project and some cross-overs are made on the Niamey-Tillabéri-Gao-Tombouctou-Mopti axis, the telecommunication requirements of the Niger valley will be amply covered.

Phase I: Preliminary studies:

Review of existing networks affected by the Liptako-Gourma project and in the Niger valley;

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Collection of data on the existing load and preparation of load projections in the light of the economic development projects for the area;

Identification of the transmission channels and switching centres to be constructed.

Phase II: Detailed studies of the transmission channels and switching centres identified in phase I:

Detailed economic studies of the projects;

Detailed studies of the transmission systems and switching centres recommended: plant and equipment, buildings, construction work, etc.

Phase III: Implementation.

(ii) Rural telecommunication service

The problem which the Sahel rehabilitation programme will have to tackle very speedily is that of having available the appropriate means of telecommunication for links with country towns, farms and rural training centres.

A rural telecommunication service can be set up cheaply and easily.

One example of a rural telecommunication service is the radio call service in Kenya. A central office at Nairobi is equipped with an HF or VHF transmitter and a set of receivers. Each branch linked to the system is equipped with a small transmitter-receiver. Calls are booked between certain hours for predetermined times. The equipment costs relatively little and the quality is completely satisfactory.

For example, using VHF equipment, the cost per station is roughly $2,000 and the range of the link is roughly 100 km.

The study can be carried out in three phases:

Phase I: Preliminary studies:

This phase consists in:

Studying the state of existing equipment and methods of operation;

Identifying, in collaboration with the government authorities and SSO officials with regard to the requirements of other agencies, the areas that will be involved in the installation of the rural telecommunication service;

Determining the operating methods to be used to integrate this service into the national telecommunication network.

Phase II: Detailed study:

After phase I, decisions will be taken on:

The operating methods most suitable for deriving maximum service from the existing links and enabling them to carry the rural telecommunication service;

The existing equipment to be improved or replaced;

The equipment to be acquired for the rural telecommunication service and its cost.

Phase III will consist in implementation of the project.

(iii) Co-ordination of means of telecommunication managed by various authorities

This is a medium-term and long-term project. It will entail:

Organizing, in an initial period, the co-ordination of the various means of telecommunication in order to derive the maximum yield from them, if necessary through mutual assistance;

Taking into account, in long-term plans for the transmission system, the needs of services which generally have their own networks, particularly the meteorological services.

(iv) Rural broadcasting

At the time of the regional meetings held in 1960-1962, UNESCO decided to have a study made of the role of the information media in economic and social progress.

Surveys and studies carried out in several countries have shown the excellent results obtained from rural broadcasting of programmes in the form of rural "forums". In India, for example, the Intensive Agricultural District Programme, financed by the Ford Foundation, includes as its first point a "block" of related techniques: "The work done in India in recent years to improve agriculture has been directed primarily towards the introduction of simple techniques, such as using improved seed, green manuring, planting rice in rows instead of sowing it broadcast. The Programme provides for the simultaneous application of a 'block' of related techniques such as the use of better seed, improved preparation before sowing, the use of fertilizers at the right time and in the right amount, better utilization of water, and measures to protect plants. The 'block' of techniques varies from region to region, but always includes a group of techniques which, because of their interaction, are much more productive than any technique applied in isolation. The techniques used are those that farmers can apply under existing conditions, for which technical instructions and suitable equipment can be provided, and which the farmers themselves agree to try ...."

Demonstration is the technique used most often: "The Programme attaches great importance to demonstrations in the field to teach farmers new methods of ploughing and planting, applying chemical and organic fertilizers, processing and selecting seeds, using and draining off water, protecting plants, harvesting, drying and storing grain ...."

Twenty rural "forum" programmes were used in India; they were broadcast to 150 listening and discussion groups in villages in five districts of the same language in one state. Rural broadcasting, based in the villages, has therefore played a very important role.

Some countries in Africa have similar "forums": audio-visual programmes (projection of slides with accompanying sound) in the Central African Republic, educational television in Senegal and the Upper Volta, and so on.

The technical facilities for the broadcasting centres that are needed do not pose serious problems and their cost should be fairly small.

It will therefore be necessary to:

Provide good coverage of target areas for radio programmes aimed at rural development;

Bring transistor radios within the means of the people.

(iv) 1. Radio coverage of the Sahelian zone

The technique currently used to provide good radio coverage is:

Having regional short-wave retransmitters linked to a local medium-wave transmitter, or

Using a transmission system, generally a broad-band microwave radio relay system, to reach a regional or local transmitter, which may be an FM transmitter.

Through the use of these techniques, national programmes can be broadcast more effectively, while regional stations can devote special attention to rural development programmes. Alternatively, it is possible to construct exclusively regional stations to broadcast rural development programmes.

The project would be as follows:

Stage I: Preliminary studies:

Using the competent services of Governments and other interested international agencies (FAO, UNESCO), it would be a question of:

Defining a policy for involving radio, and possibly television, in rural development;

Selecting sites that could serve as centres for rural broadcasting.

Stage II: Implementation:

This would involve purchasing and installing equipment and training personnel.

The role of ITU in this field would be mainly technical:

Selection of possible transmission systems and radio broadcasting equipment;

Selection of frequencies and assessment of sites;

Possibly, assistance in installation and in the training of personnel.

(iv) 2. Inexpensive radio receivers

The price of transistor radios, although quite low ($30 to $40), is beyond the means of the peasant or labourer.

UNIDO gave its attention to these problems and convened a meeting at Vienna, from 13 to 24 October 1969, on the manufacture of telecommunication equipment and inexpensive radio receivers.

Production of inexpensive receivers is economically feasible if the output is approximately 400 receivers per day, which would raise the density of radio receivers in the Upper Volta, for example, to 5 per cent in three years.

The International Radio Consultative Committee (CCIR) has made some studies on radio receivers (Opinions 415 and 416, 1963).

Some African countries have plants for assembling receivers. The price varies from $14 to $40, the average price being $25.

7. It will be necessary to:

Identify, in co-operation with the competent national authorities and other international agencies (UNIDO), the needs that must be met;

Make a study of existing plants for assembling receivers in the region;

Make a study of the approach to be adopted in manufacturing radio receivers in order to meet the needs of broad sectors of the population;

Make recommendations to Governments in the light of the points mentioned above;

Perhaps carry out a study on establishing factories to manufacture radio receivers;

Perhaps supervise the equipping of the factories, their initial operation and personnel training.

This project could be implemented jointly by ITU and UNIDO, ITU being more particularly responsible for matters relating to standards.

/

(v) Vocational training

As the various projects are implemented, vocational training for technicians will be provided to ensure utilization of the equipment; existing schools will be used as far as possible.

8. Conclusion

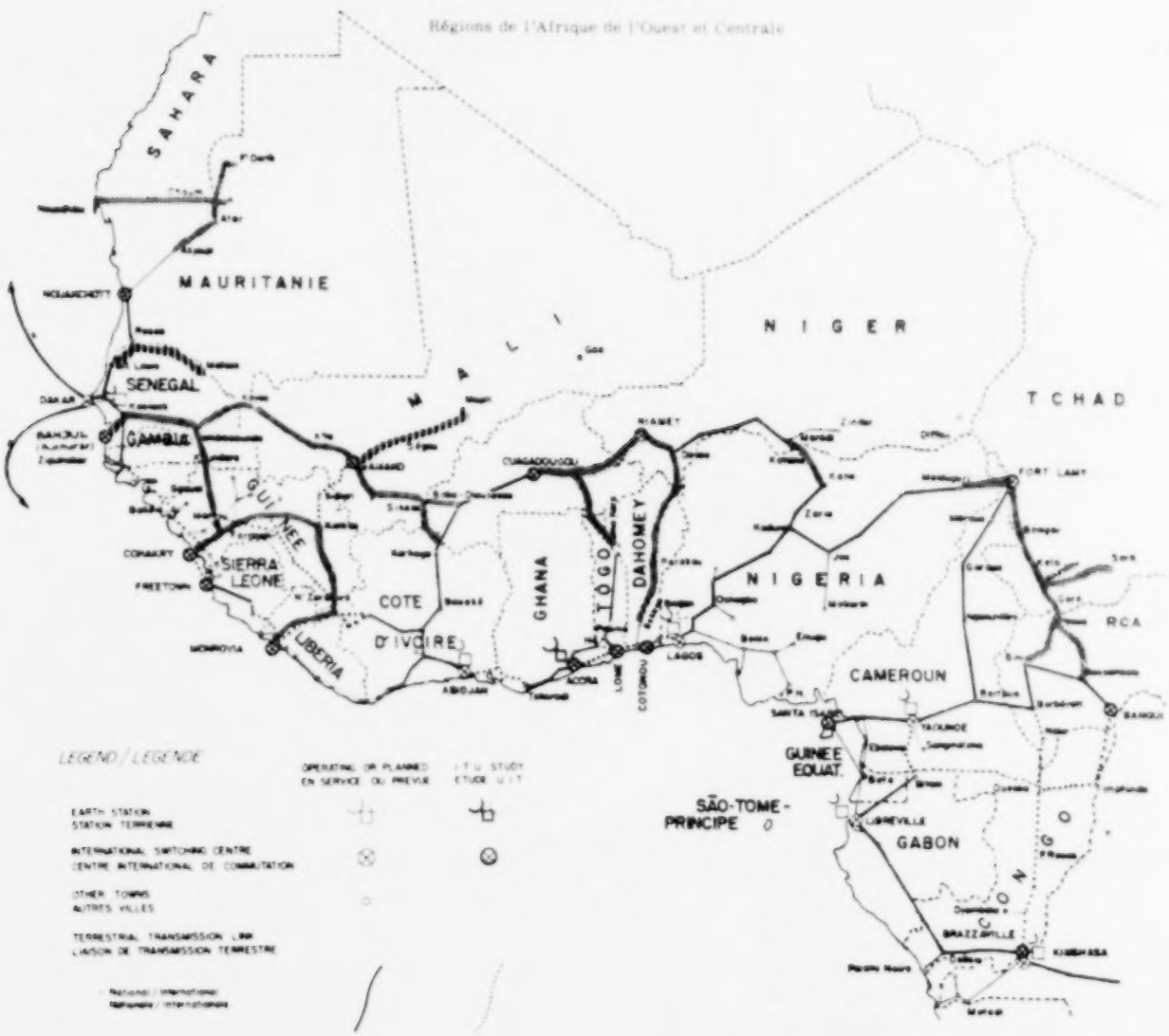
The preceding analysis has attempted to suggest in as much detail as possible what action must be taken if telecommunications are to play the role they should in the rehabilitation of the Sahel. At this stage it is difficult to calculate the amount of investment needed in this sector. That is why the above-mentioned preliminary studies are needed if the indicative figures for the projects are to be obtained soon.

ITU is willing to continue its support, either as executing agency or in an advisory capacity.

PAN-AFRICAN TELECOMMUNICATION NETWORK
RESEAU PANAFRICAIN DE TELECOMMUNICATIONS

West and Central Africa Regions

Régions de l'Afrique de l'Ouest et Centrale



LEGEND / LEGENDE

	OPERATING OR PLANNED / EN SERVICE OU PREVUE	I.T.U. STUDY / ETUDE U.I.T.
EARTH STATION / STATION TERRIENNE		
INTERNATIONAL SWITCHING CENTRE / CENTRE INTERNATIONAL DE COMMUTATION		
OTHER TOWNS / AUTRES VILLES		
TERRESTRIAL TRANSMISSION LINK / LIAISON DE TRANSMISSION TERRESTRE		
National / International / Nationale / Internationale		
National / Nationale		
SUBMARINE CABLE / CABLE SOUS MARIN		
BORDER / FRONTIERE		

(1) The boundaries on this map are not necessarily officially recognized
Les frontières portées sur cette carte ne sont pas nécessairement officiellement reconnues

UNDP / ITU PREINVESTMENT SURVEY
ETUDE DE PREINVESTISSEMENT PNUD / UIT

(Black / Noir)	Existing or under construction Existant ou en cours réalisation
(Red / Rouge)	To be completed soon, funds provided Réalisation prochaine, financement assuré
(Blue / Bleu)	To be undertaken, funds not provided À réaliser, financement non assuré

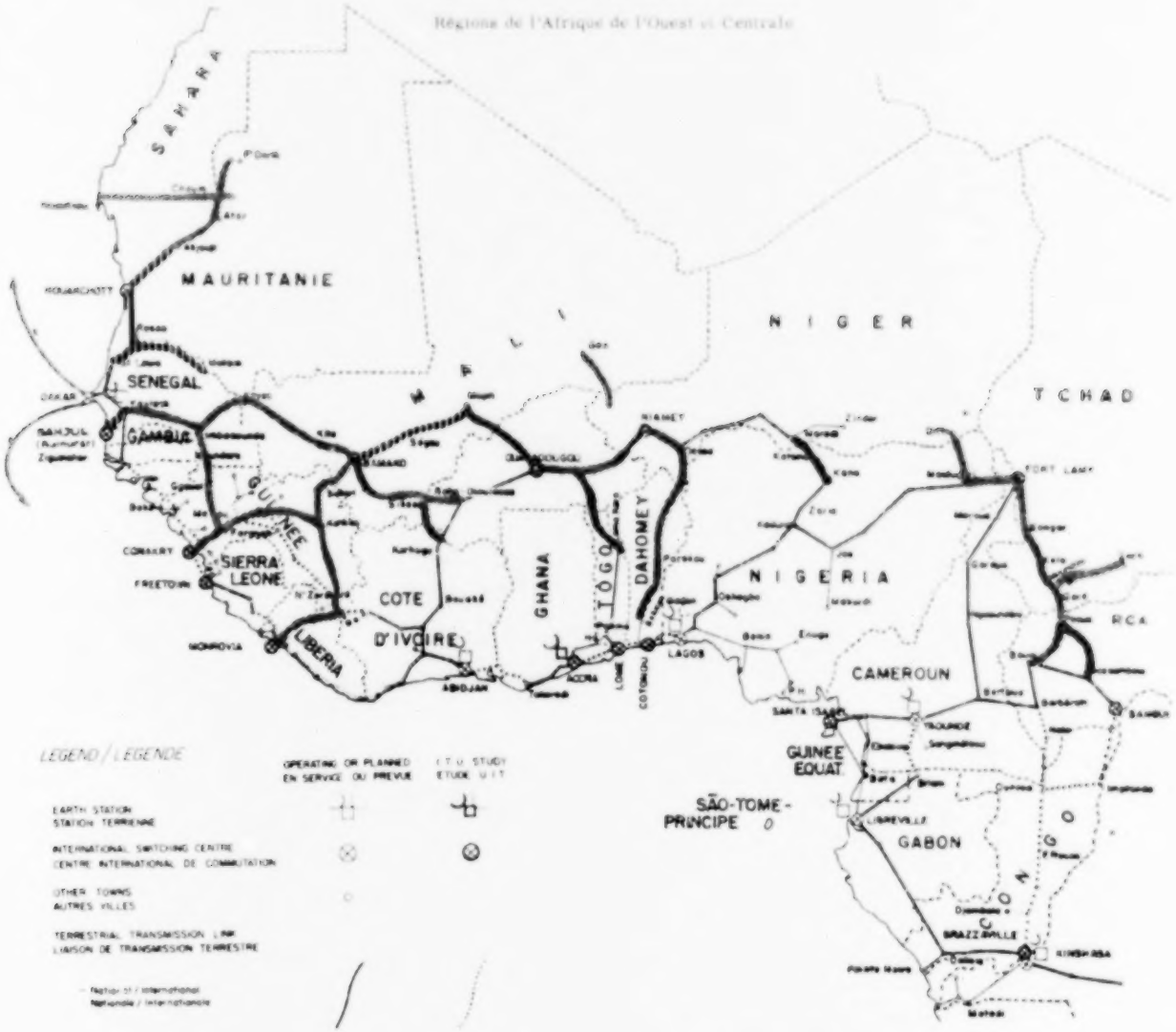
MAP No. 2692.1 (b) X

10.5.1973

PAN-AFRICAN TELECOMMUNICATION NETWORK
RESEAU PANAFRICAIN DE TELECOMMUNICATIONS

West and Central Africa Regions

Régions de l'Afrique de l'Ouest et Centrale



LEGEND / LEGENDE

	OPERATING OR PLANNED / EN SERVICE OU PREVUE	I.T.U. STUDY / ETUDE U.I.T.
EARTH STATION / STATION TERRIENNE		
INTERNATIONAL SWITCHING CENTRE / CENTRE INTERNATIONAL DE COMMUTATION		
OTHER TOWNS / AUTRES VILLES		
TERRESTRIAL TRANSMISSION LINK / LIAISON DE TRANSMISSION TERRESTRE		
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— National / Nationale		
SUBMARINE CABLE / CABLE SOUS MARIN		
BORDER / FRONTIERE		

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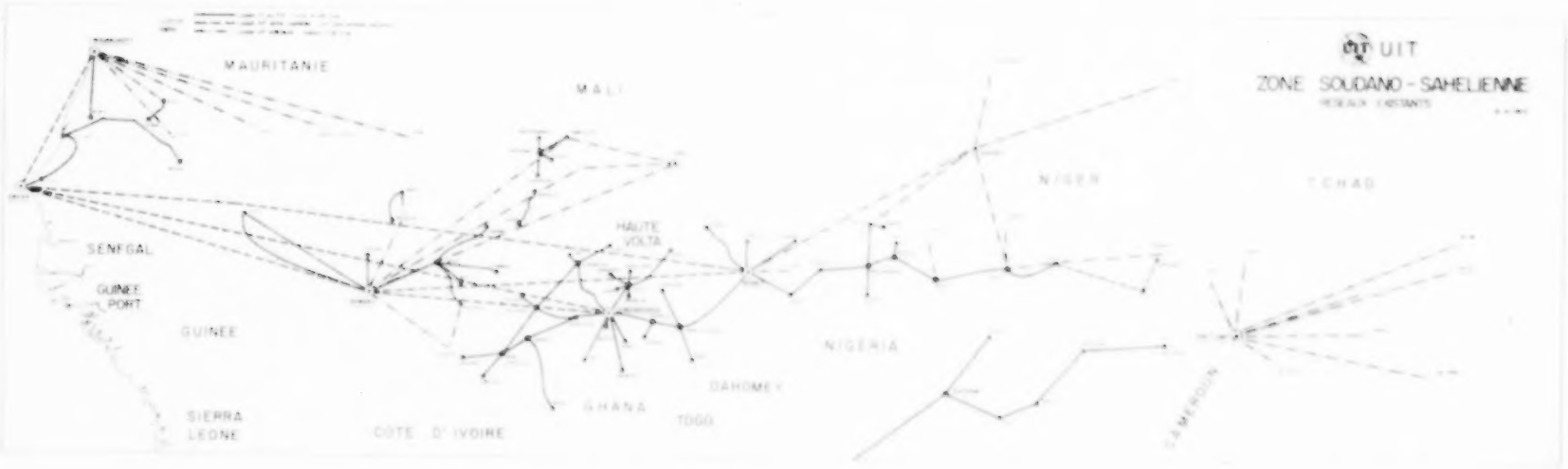
UNDP/ITU PREINVESTMENT SURVEY
ETUDE DE PREINVESTISSEMENT PNUD/UIT

(Black/Noir)	Existing or under construction Existant ou en cours réalisation
(Red/Rouge)	To be completed soon, funds provided Réalisation prochaine, financement assuré
(Blue/Bleu)	To be undertaken, funds not provided A réaliser, financement non assuré

MAP No. 2692.2 (b) X

10.5.1973

MAP 3


UIT
ZONE SOUDANO - SAHELIENNE
MAURITANIE
MALI
NIGER
TCHAD
SENEGAL
HAUTE VOLTA
GUINEE PORT
GUINEE
NIGERIA
DAHOMEY
SIERRA LEONE
CÔTE D' IVOIRE
GHANA
TOGO
CAMEROUN

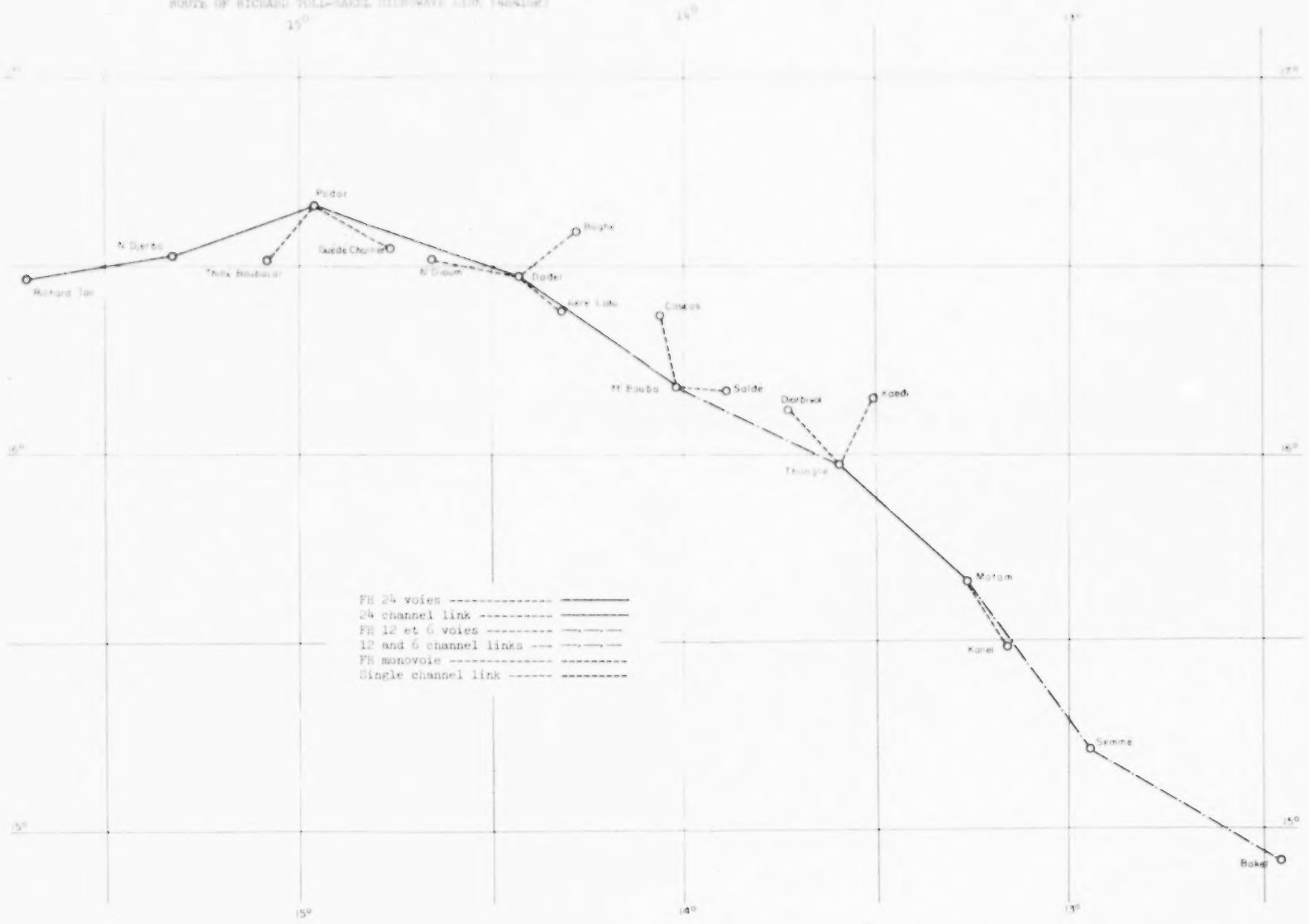

TRACE FAISCEAU HERTZIEN RICHARD TOLL-SARH (analogique)
ROUTE OF RICHARD TOLL-SARH MICROWAVE LINK (analog)
15°
14°
13°
12°
11°
10°
9°
8°
7°
6°
5°
Richard Toll
N Djambo
Thiès Boubacar
Podor
Gaede Chorimbé
N Diaum
Bogué
Dodel
Gorom Lobo
Cascas
N Boubo
Saldé
Dembaye
Koedé
Thiangle
Matam
Kanel
Semme
Bakel
FH 24 voies
24 channel link
FH 12 et 6 voies
12 and 6 channel links
FH monovoie
Single channel link

FIGURE 4

TRACE FAISCEAU HERTZIEN RICHARD TOLL-BAKEL (numérique)
ROUTE OF RICHARD TOLL-BAKEL MICROWAVE LINK (digital)

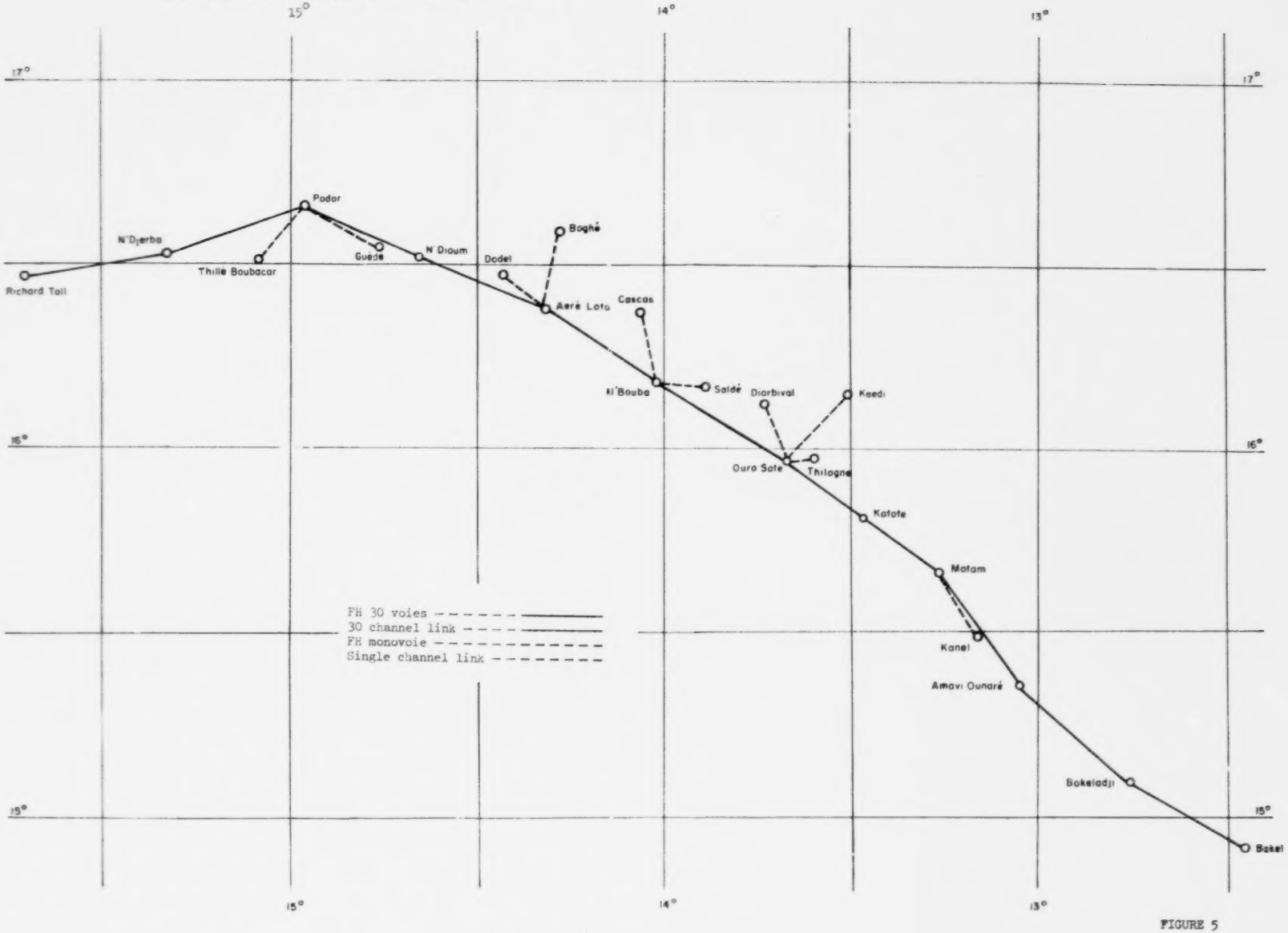


FIGURE 5